1,136,728

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,136,728

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Int. Cl.:—E 04 b 5/56.

COMPLETE SPECIFICATION

Improvements in or relating to ceiling systems

We, INLAND STEEL PRODUCTS COMPANY, a corporation organized under the laws of the State of Delaware, United States of America, of Post Office Box 393, Milwaukee 1, Wisconsin, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a ceiling system. In its more specific aspect, this invention relates to a ceiling system comprising prefabricated units and characterized by a high degree of versatility.

This invention has as its purpose to provide a ceiling system of the above character made from a plurality of prefabricated interconnecting units which may be readily assembled at the building site in a wide variety of functional patterns. The ceiling system has as a feature a generally modular construction which affords economical and complete manufacture from regularly employed building materials. In general, the ceiling system in association with the roof structure includes a hanger assembly and suitable ceiling closure elements, such as individual coffer modules, which may accommodate light fixtures.

Other features and advantages are inherent in the structure claimed and disclosed or will become apparent to those skilled in the art upon reference to the following detailed specification and preferred embodiments thereof in conjunction with the accompanying drawings, in which:

Figure 1 is a perspective view of a building interior illustrating a ceiling system constructed in accordance with the present invention, with the ceiling system in an erected condition;

Figure 2 is a transverse view in cross section showing in detail the coffer construction of the invention;

Figure 2a is a partially fragmentary sectional view on line 2a-2a of Figure 4;

Figure 3 is a transverse view in cross section of a coffer of a modified form falling within the scope of the invention;

Figure 4 is a partially exploded fragmentary perspective view that illustrates the coffer and runner assembly of the ceiling system of the invention;

Figure 5 is a partial plan view of the hanger assembly and runners in fragmentary of the ceiling system;

Figure 6 is a sectional view taken on line 6-6 of Figure 5.

Figure 7 is a sectional view on line 7-7 of Figure 6.

Figure 8 is an elevational view partly in section showing the hanger assembly falling within the scope of the invention;

Figure 8a is a plan view of the truss clip;

Figure 9 is an exploded fragmentary perspective of Figure 8;

Figure 10 is a partially exploded fragmentary perspective view showing the hanger assembly and runners suspended from the deck unit.

Figure 11 is a sectional elevation of the hold-down clip;

Figure 12 is a plan view of the hold-down clip; and

Figure 13 is an exploded fragmentary perspective view of a modified form of the ceiling system falling within the scope of the invention.

Referring to Figure 1, there is illustrated a ceiling system embodying the present invention, and which includes a roof deck, indicated generally at 10, which is typically supported by suitable cross braces, and trusses and the like structural elements (none

[Price 4s. 6d.]

of which are shown). A plurality of runners or chord members, indicated generally at 12 and to be described hereinafter in greater detail, are suspended from the roof deck by means of a mounting having an appropriate cover plate, indicated generally by the number 13 and also to be described hereinafter in detail. Elongated truss web members 14 support the mounting, and the web members are connected at their opposite ends to the interior surface of the deck 10 by suitable attaching means, indicated generally at 16. The mounting provides means for supporting the runners 12 and for supporting the ceiling system from the roof deck 10. In addition, the building is provided with columnar or wall elements such as a wall element 20 extending vertically between the floor 22 and the ceiling system, and the mounting may be provided with means for supporting non-structural wall elements along the top thereof.

In the ceiling system, 24 designates generally a ceiling of modular assembly comprising ceiling closure elements. There is illustrated an assembly of individual identical coffer modules. The coffers (described below in greater detail) are supported in preselected assembly by the horizontal runners 12, and each coffer is suitably recessed to accommodate a lighting fixture.

In referring now to Figures 2-4, there is shown in detail coffer 26 as a suitable ceiling closure element, including a number of modifications calling within the scope of the present invention. The individual coffer modules employed in a ceiling system are generally of identical construction so that parts described with reference to one module are found on the other. The coffer illustrated is substantially symmetrical and includes a frusto-pyramidal base 28 terminating at its bottom marginal edges with an upwardly directed flange 30 which circumscribes said base, and which flange 30 has for strengthening purposes an outwardly reverse bend 32. Opposed parallel endwalls 34, having a configuration substantially that of an isoceles triangle, extend vertically from the top marginal edges of one pair of opposed faces of the frusto-pyramid 28. Oppositely pitched panels 36, which converge upwardly, likewise extend from the top marginal edges of the other pair of opposed faces of the frusto-pyramid 28 and further extend between the marginal sides of endwalls 34. The panels 36 form with each of said other pair of opposed faces of the frusto-pyramid an angular cross-section, and are provided along their longitudinal marginal edge with a substantially vertical support and strengthening rib 38 having a transverse flange 40. A second panel member 42 extends from the longitudinal marginal edge of panel 36 to the longitudinal center of the coffer and between the marginal sides of endwalls 34. In the preferred embodiment, the panels 36 and 42 are of substantially equal area, and the width of the panel 36 is approximately one-half the distance between the top marginal edge of the frusto-pyramid 28 and the apex of the coffer. The panels 42 and/or the panels 36 may be perforated depending upon the acoustical requirements, and a suitable acoustical batt, such as a mineral fiber batt, may be provided on the back side of the panel.

The panel 42 terminates along one longitudinal marginal edge with an upwardly directed flange 44 which desirably is at substantially the same angle with respect to the panel 42 as the flange 38 is with respect to the panel 36. The opposed longitudinal marginal edge of the panel 42 is angularly shaped downwardly to provide a shoulder 46 which extends from the panel 42, and is then flanged upwardly and inwardly at 48.

A supporting rail 50 substantially in the form of an inverted "T" extends between the endwalls 34 and is secured thereto by any suitable means such as sheet metal screws or the like. The supporting rail comprises a longitudinal web portion 52 and opposed transverse flanges 54 angularly shaped with respect to the web portion 52 to provide a seating arrangement for either longitudinal marginal edge of the panels 42, as will be explained in more detail hereinbelow. The lateral marginal edges of the panels 42 are joined to the endwalls 34.

The coffer 26 is suffciently recessed to accommodate suitable lighting fixtures 58 such as florescent tubes or the like. Conventional connecting elements, indicated generally at 60, are provided for the light fixtures. The number of light fixtures provided in any particular coffer will depend upon the illuminating level requirements in the room, and the configuration and size of the coffer can be varied to accommodate a plurality of florescent tubes or to accommodate a plurality of such tubes in paired arrangement. (See Figure 2.) A diffuser 62 of conventional structure is provided in combination with the light fixture to improve the illumination such as by creating indirect lighting thereby minimizing glare.

In the ceiling system, there is included a plurality of horizontal runners indicated generally at 12 in Figures 1 and 4 and supported by means of the mounting. In order to show the several elements in greater detail, there is shown in the remaining Figures, which illustrate the preferred embodiments of the invention, a main runner 64 and a cross-runner 66. Both such runners 64 and 66 have opposed lateral shoulders 67 and elongated webs 68 extending substan-

tially the complete length of the runners. The webs 68 are turned inwardly and downwardly at 69 to provide for a guide rail 70 and a re-entrant groove 72. In addition, the webs 68 of both the runners 64 and 66 are provided with aligned apertures 76 at spaced intervals.

With respect to the main runer 64, each end is provided with an upwardly turned tab 82 disposed intermediate the opposed webs 68 and set inwardly for a slight distance with respect to the marginal edge. The cross-runner 66 is provided at each end with an off-set 84 to extend above the shoulder 67 of the main runner 64 such that upon assembly, the runners 64 and 66 may form a common plane.

Referring to Figures 5, 6, 8 and 9, there is shown in detail the mounting 13 supported from the roof structure as described below in detail, which includes a spider 88 having a horizontally disposed section 90 and opposed sides or legs 92 depending from said horizontal section. (See Figures 5 through 10.) In addition, there are four transverse flanges or lugs 94 protruding from near the top of sides 92 and being of sufficient length to extend over at least a portion of guide rails 70 when assembled, as will be more apparent hereinbelow. Detents 96 desirably formed integrally with the spider, extend downwardly from both edges of the horizontal section 90 and are indented from the sides 92 intermediate a pair of flanges 94 and provided with recesses 97.

Mounting 13 further includes a pair of opposed channels 98 formed integrally with the spider 88 and open upwardly and outwardly with respect thereto. The channels 98 depend from the sides 92 below the flanges 94 and the detents 96 and extend laterally beyond the edges of said sides. The channels 98 open upwardly with respect to the disposition of the mounting when employed in the ceiling system, and cooperate with the re-entrant groove 72 of the main runners 64. There is provided in the bottom of each channel 98 a centrally disposed elongated slot 100. The elongated slots 100 are substantially the same length as the sides 92 and desirably are formed in the channels along the longitudinal juncture between the sides 92 and the channels 98.

There is further provided to co-act in association with said spider 88 a cradle 102 disposed beneath said horizontal section 90. The cradle 102 has a bottom plate 104, which has substantially the same dimensions as the horizontal section 90 of the spider 88, and opposed extending legs 106 which are slideably mounted through the elongated slots 100 of the channels 98. Upon mounting the cradle with the spider 88, the legs pass upwardly through the slots 100 to the outside of the sides 92 and in firm slideable engagement with the sides 92. As illustrated in Figures 5, 6, and 8, upon the vertical disposition of the cradle with the spider, the legs on each side of the cradle pass to both sides of the detents 96 and to the inside of the opposed flanges 94. A bottom plate 104 is provided with an opening 108 suitable for accommodating the passage therethrough of a cable or the like (not shown) or for accommodating the connecting element of a coverplate 162.

The mounting 13 further includes a pair of brackets 110, each bracket having a rear attaching member or base plate 112 and a pair of opposed struts 114 extending from the base plate. In addition, base plate 112 is provided with a centrally disposed transverse flange 115 having a neck portion 116 which cooperates with the appropriate detent 96 whereby the connection of the bracket 110 with the spider 88 is rendered more secure. At each side of the flange 115, the base plate 112 is bent backwardly at 117 and downwardly at 118 to provide downwardly open elongated channels 120 formed integrally with the base plate 112 and disposed opposite the struts 114. Channels 120 are of sufficient depth to accommodate the guide rails 70 of the runners 64 and to co-act with the channel 98 such that upon seatable engagement in channel 98, the struts 114 are disposed outwardly from the spider 88. The base plate 112 is provided with a detent 122 which is formed by a centrally disposed flared out section of the base plate. Each strut 114 is provided with flanges 124 and 126 extending from the opposite horizontal edges, and the flange 126 is formed along the lower horizontal edge of the strut 114 by bending the flange outwardly at 128 and upwardly at 130. In addition, the flange 126 and the strut 114 are provided with aligned openings 131 to accommodate a screw 132. The flanges 124 and 126 are formed such that upon assembly, the flanges 124 engage the guide rails 70 of the cross-runner 66, and the flange 126 co-acts with the re-entrant grooves 72 whereby the bracket 110 is in slideable engagement with the flanges 68 of the cross-runner 66.

The mounting 13 is suspended from the roof deck by elongated truss web members 14. In order to accomplish the proper suspension, the horizontal section 90 of the spider 88 is provided with a centrally disposed, internally threaded rotatable sleeve 134 having a seat 136 with one or more slots 137 to accommodate a spanner wrench (not shown). A plurality of metal washers 138 is provided on both sides of the horizontal section 90 of the spider 88. Desirably one or more rings 139 of insulating material, for example, asbestos, is inserted between

some or all of the metal parts to provide a thermal break for inhibiting the transfer of heat in the event of a fire in the building. There is provided an elongated bolt member 140 which threadedly engages the sleeve 134 and has an upper squared shank portion 142 positioned just below a head 144. A truss clip 146 includes spaced extension 148, a centrally disposed elongated aperture 150 and a recessed portion 152 suitable for accommodating the head 144 and the squared shank 142 of the bolt 140. The bolt 140 extends through the elongated aperture 150, and the head 144 passes through this aperture only when the longitudinal axes of both the head 144 and the aperture 150 are in alignment. In this manner, the bolt 140 may be inserted through the bottom of truss clip 146, and when the head 144 and squared shank portion 142 have cleared the aperture 150 and the bolt is given a quarter turn, the squared shank portion 142 of bolt 140 is keyed in the aperture whereby the bolt is held against rotative movement. A locking nut 156 is internally threaded for engaging the bolt 140. The truss clip 146 accommodates a bottom chord unit 158 which is secured to web member 14, and the truss clip is welded to the bottom chord unit at 160 as shown in Fig. 8. The bottom chord unit 158 is seated on the edges of the truss clip 146 between the extensions 148 thereby preventing said bottom chord unit from going into the recessed portion 152 to always provide sufficient clearance for the squared shank portion 142 and the head 144. Upon tightening the locking nut 156 against the truss member 144, mounting 86, Fig. 6, is secured in place and held against rotative movement. The bottom chord unit 158 is affixed to the web member 14 as by welding, and the web member 14 is suspended from the roof deck and connected to the interior thereof by suitable attaching means 16 (which forms no part of this invention).

The cover plate 162 is provided at the juncture between the main runners 64 and the cross runners 66 below the mounting 13. The cover plate may be secured in place by any well-known means such as a snap-on clip or tapping screw. The fastening means illustrated in Figure 10 includes a dog 164 which is inserted through the opening 108 of the cradle 102. The dog is given a quartet of a turn for seating engagement with the plate 104 and a screw 166 is tightened to fasten the cover plate 162 in place.

Where desired, a hold-down clip 168, Fig. 11, may be employed in conjunction with the runners 64 and 66 and the ceiling closures in order to make the structure more secure and to retain the respective elements in position. The hold-down clip extends between the webs 68 of the runners, and includes a horizontal top member 170 having downwardly turned flange members 171 which spans webs 68. A horizontal bottom member 174, disposed beneath the member 170, extends between the webs 68. Spaced flanges 176 extend upwardly from the member 174 for engagement with the downwardly open re-entrant groove 72 of the web 68. The flange 30 of the coffer 26 is engageable in the groove formed by the flange 171 and the web 68. A screw 180 is tightened and draws the respective members into close fastening arrangement.

In assembling a ceiling system of modular construction, there is illustrated a plurality of horizontally disposed main runners and cross-runners measuring five feet in length for supporting the coffer modules having dimensions just slightly less than the runners. It should be understood, however, that these several components employed in the modular assembly may have any dimension within practical means depending upon such factors as the construction materials used, the type of building, the ceiling space and the lighting and ventilating requirements for the building. In the mounting 86, the spider 88 and the cradle 102 are assembled by slideably inserting the legs 106 through the elongated openings 100 provided in the bottom of the channels 98, whereby the legs 106 pass to the outside of the sides 92 and between the flanges 94. The bolt member 140 having the locking nut 156 threaded thereon is threadedly engaged with the sleeve 134. The squared shank portion 142 of the bolt 140 is keyed with the recess 152 and the nut 156 is tightened against the truss clip 146 which is welded to the bottom chord truss unit 158. It will be observed that before the nut 156 is tightened against the truss clip 146 the horizontal disposition of the spider may be adjusted by adjusting the position of the bolt 140 in the aperture 150.

With respect to the main runners 164, the webs 68 are engaged with the channels 98 of the spider 88 such that the outermost vertical channel wall of the channel 98 enters the re-entrant groove 72 and the flange 69 is seatably engaged in the channel 98. The rail 70 passes beneath the flange 94 which assists in maintaining the assembly between the main runners and the spider 88. The runner 64 is inserted into the channel 98 for a sufficient distance to bring the upwardly turned tab 82 under the opening 108 so that when the cradle 102 is pulled downwardly, the base 104 lays against the runner 64 and the tab 82 protrudes through the opening 108 and is bent downwardly, thereby preventing longitudinal separation of the runners 64. This is important in that the connection between the tab 82 and the cradle

102 provides a connection to take lateral loads. A second main runner 64 extending from the mounting 86 in an opposite direction is similarly assembled with the mounting.

Cross-runners 66 are now ready to be assembled in the ceiling system. To accomplish this, the cross-runners may be assembled with the brackets 110. The rails 70 of runners 66 are slid under the flanges 124 but over the longitudinal marginal edges of the flanges 126 such that the flanges 126 are in slideable engagement with the reentrant grooves 72. The brackets 110 are then connected to the spider 88 as illustrated in Fig. 6. In this manner, the channels 98 and the channels 120 are brought into engagement such that the outward channel walls of the channels 98 enter the channels 120 and the downwardly directed walls of channels 120 enter channels 98. Upon assembly, it will be observed that portions of the webs 68 of the main runners 64 are seatably arranged in the channels 120. By reason of this arrangement, the struts 114 of the brackets 110 project horizontally with respect to the spider 88. The base plates 112 of the struts 110 are disposed between two pairs of flanged detents 94 which limit the horizontal movement of brackets 110. In addition, the necks 116 cooperate with the detents 96 thereby preventing the brackets 110 from slipping out of the channels 98.

The cross-runners 66 are thus disposed substantially normal to the main runners 64, and the off-sets 84 extend over the shoulders 67 of the main runners 64 whereby the main runners and the cross-runners form a common plane. One or more hold-down clips 168 may be employed in conjunction with each main runner and cross-runner as described above.

After the horizontal runners are in place, the coffer 26 may be positioned thereon. In the manufacture of the coffers, the panels 42 are manufactured as separate units in order to afford greater versatility, as explained more fully hereinafter. In this manner, the coffer is manufactured and shipped to the building site as comprising the frusto-pyramidal lower section 28 having integral endwalls 34 conjoined with converging side panels 36, and the separate unattached panels 42.

According to the one embodiment illustrated in Figure 2, the supporting rail 50 extends longitudinally between the endwalls 34 and is affixed thereto by any suitable means substantially at the apices of the endwalls. Panel 42 is so positioned in the coffer assembly that the angular terminus formed by the shoulder 46 and the flange 48 is supported by the flange 54. The opposite marginal edge of the panel 42 overlaps the top longitudinal marginal edge of the panel 36 and the rib 38 serves as a stop means and a support in maintaining the panel 42 in position. The coffer is then positioned on the horizontal runners as illustrated such that the bottom of the frusto-pyramid 28 is supported by the shoulders 67 of the runners 64 and 66 and is maintained in position by means of the flange 30 which engages the transverse webs 68.

Before the cover plate 162 is put in place, the horizontal disposition of the ceiling assembly is surveyed. In the event the ceiling is not level, the sleeve 134 is rotated. This may be accomplished by means of a spanner wrench, or other suitable tool, which is extended through the opening 108 of the cradle 102 into engagement with the slots 137 of the sleeve 134. The rotation of the sleeve effects axial translation of the mounting 86 relative to the bolt member 140 thereby causing the mounting to move upwardly or downwardly. Once it has been determined that the ceiling is level, the cover plate 162 is placed in position.

It will be observed that the embodiment illustrated in Figure 2 provides a broad and deeply recessed coffer having a frusto-pyramidal lower section and a recessed upper section including vertical endwalls and converging sidewalls. A coffer of this design can accommodate one or more lighting fixtures depending upon the illuminating level required. The embodiment illustrated in Figure 2 shows a coffer containing three lighting fixtures each accommodating two florescent lamps.

According to the modification illustrated in Figure 3, the longitudinal supporting rail 50 is affixed to the endwalls 34 adjacent its horizontal base line and just above the frusto-pyramid 28. The angular terminus of the panel 42 formed by the shoulder 46 and the flange 48 is brought into overlapping engagement with the longitudinal marginal edge of the panel 36, and the rib 40 engages the flange 48. The opposite longitudinal marginal edge of the panel 42 is brought into overlapping engagement with the flange 54 of the supporting rail 50 with the flange 44 adjacent the web 52. In this manner, the panels 36 are sloped inwardly and downwardly whereby the upper section of the coffer is essentially divided into two longitudinal sections. In this manner, each longitudinal section can accommodate a lighting fixture, and as illustrated each fixture is employed to accommodate two florescent lamps. It should be understood, however, that the number of lighting fixtures and amount of illumination is solely dependent upon the room requirements and forms no part of the invention. It will be observed that Figures 2 and 3 show the versatility of the ceiling system of the in-

vention such that it can be modified at ease to accommodate lighting requirements and/or acoustical requirements.

The ceiling system of the present invention further may be employed in the support of wall panels, room dividers, and the like non-structural wall elements. The top of such a vertical structure, e.g., a wall panel, may be provided with a boss (not shown). Upon assemblage of the ceiling system, the boss of the column 20 is inserted through the opening 108 of the cradle 102. The cover plate 18 is omitted at any point where such a connection occurs. In this manner, the vertical structure is supported in its vertical position. This feature is particularly desirable where room dividers are employed to vary the room size from time to time depending upon the requirements. Thus, in those instances where wall panels or wall dividers are employed for varying the size of the room, the top of the wall divider may be provided with an appropriate boss for insertion in the opening 108 of the cradle 102. Hence, the position of the wall divider may be altered with relative ease.

Figure 13 illustrates a modified form of the ceiling structure in which a ventilating means and a flat pan arrangement are incorporated into the ceiling system. Either a main runner 64 or a cross-runner 66 is provided with an elongated opening 182 between the transverse webs 68. An air-tight ventilating boot 184, desirably formed of sheet metal, and having a fire damper 183, is attached to the runner and opens at the elongated opening 182 of the runner. The boot extends upwardly from the runner so that when the ceiling is assembled, the boot is not visible. A duct 186 opens to the boot, and air from a source not shown passes through the duct into the boot and through opening 182 into the building. It should be understood that the ventilating boot may be of any configuration other than as illustrated and of any capacity depending upon the building requirements, and further that the number of runners and the position of the runners employed in the building for accommodating the boot can be varied to meet the building requirements. A diffuser plate 188 is employed to cover the opening 182 and to control air flow.

Further with respect to Figure 13, in not all instances is it necessary or desirable to provide in the ceiling system coffers only containing lighting fixtures. Hence, the ceiling system of the invention may be modified to provide for the incorporation therein of a plurality of flat pans or panels 190. In order to achieve this objective, there is provided one or more off-module runners 192 which are of substantially the same design and structure as the cross-runners 66 and likewise have shoulders 67 and webs 68. There is illustrated two off-module runners extending betwen two main-runners 64 and parallel with two cross-runners 66. Brackets 110 are provided at each end of the off-module runners, with the channels 120 being engaged with the rails 70 in the cross-runners 66. The bracket 110 is positioned at an aperture 76 in the cross-runner 66 whereby detent 122 registers with the aperture 76 to assist in fastening the bracket to the runner 66. In this manner, an off-module runner 192 is extended between two spaced parallel cross-runners 66 and supported at either end by the bracket 110 substantially as described above. The flat pans 190, having stiffening flanges 194 extending upwardly, are supported by the shoulders 67 of off-module runners 186 as well as by the shoulders 67 of the main runners 64 and/or cross-runners 66. At those positions when a hold-down clip 168 is employed, the flange 194 of the flat pan is engageable in the groove formed by the flange 171 and web 68. (See Figure 11.)

WHAT WE CLAIM IS:—

1. A ceiling system in association with a roof structure, comprising a spider section supported by the roof structure and having two parallel spaced sides depending therefrom; each of the sides terminating in a horizontally disposed lateral channel opening upwardly with respect to the spider section, a bracket engageable in each of the channels and extending normally and horizontally therefrom, main runners and cross-runners supportable by the spider section by engagement with the channels and brackets respectively and ceiling closure elements supported by the main and cross-runners.

2. A ceiling system according to claim 1, wherein the vertical disposition of the spider section is adjustable relative to the roof structure.

3. A ceiling system as claimed in claim 1 or 2, wherein the brackets have spaced apart struts having peripheral flanges extending therefrom, the struts being substantially normal to the channels upon engagement of the brackets in the channels; the main and cross-runners have spaced longitudinal webs extending at right angles thereto such that outwardly extending shoulders are formed between the webs and the longitudinal edges of the runners, the free edges of the webs being bent through 180° to form grooves, the grooves of the main and cross-runners being slidably engageable with edges of the channels and with the peripheral flanges on the struts respectively such that a pair of main runners and a pair of cross-runners are disposed normally to one another with off-sets on the cross-runners engaging the shoulders of the main runners,

the off-sets being equal in length to the distance on the main runners between the longitudinal edges and the webs; and a cradle having vertically extending legs and a centrally disposed opening is disposed beneath the spider section, the legs being slidable with respect to the spider section through elongated openings in the bottom portions of the channels whereby the vertical disposition of the cradle is adjustable with respect to the spider section, the opening accommodating tabs interposed between and transverse to the webs on the main runners, the tabs being bent over the edge of the opening to prevent longitudinal separation of the main runners.

4. A ceiling system as claimed in claim 3, in which the brackets and the cradle are aligned with the spider section by means of a pair of spaced lugs projecting outwardly from each of the side walls above the channels and a detent device indented from each side wall and depending downwardly above the channels between the lugs.

5. A ceiling system according to any preceding claim wherein a plurality of spaced, horizontally-disposed off-module runners extend and are supported between the main runners substantially parallel to the cross runners.

6. A ceiling system as claimed in any preceding claim, having an internally threaded sleeve mounted on the spider section for reception of an element for connecting the mounting to the roof structure.

7. A ceiling system as claimed in claim 6, in which the connecting element is restrained against rotative movement.

8. A ceiling system as claimed in claim 6 or 7, in which the sleeve includes a thermal break.

9. A ceiling system according to any preceding claim, wherein the ceiling closure elements comprise coffers having frusto-pyramidal bases and upwardly converging sidewalls.

10. A ceiling system according to claim 9, wherein the coffers also have spaced end-walls extending upwardly from the base.

11. A ceiling system according to any of claims 1 to 8, wherein a plurality of flat pan ceiling closure elements are supported by the runners.

12. A ceiling system in association with a roof structure substantially as herinbefore described with reference to the accompanying drawings.

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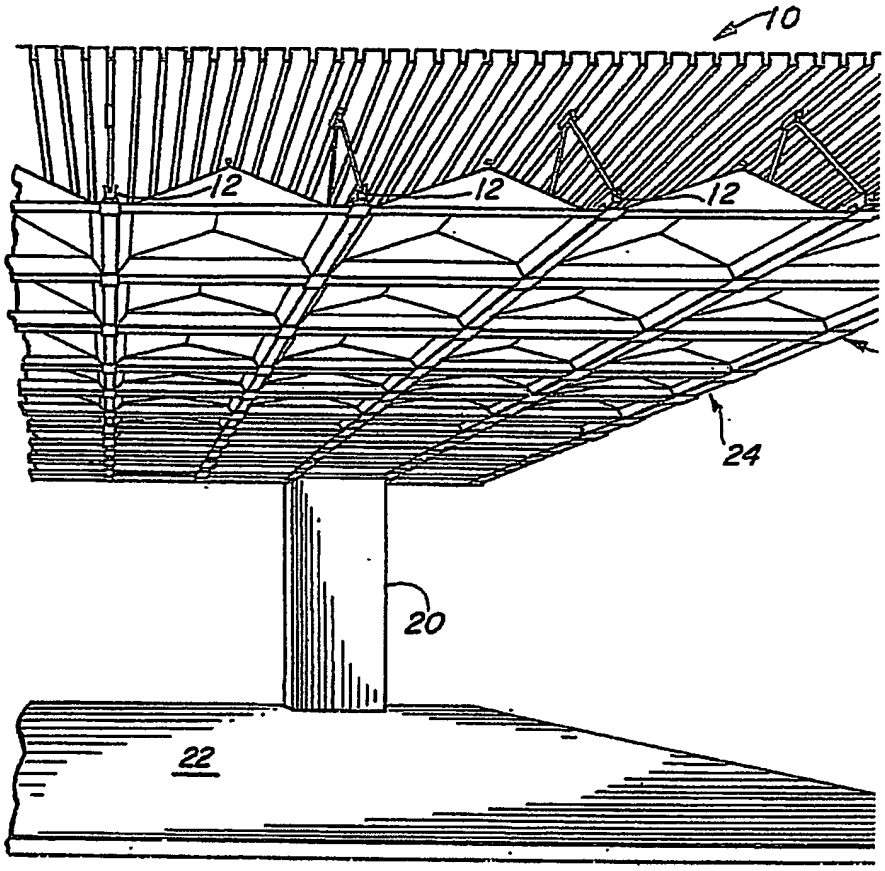
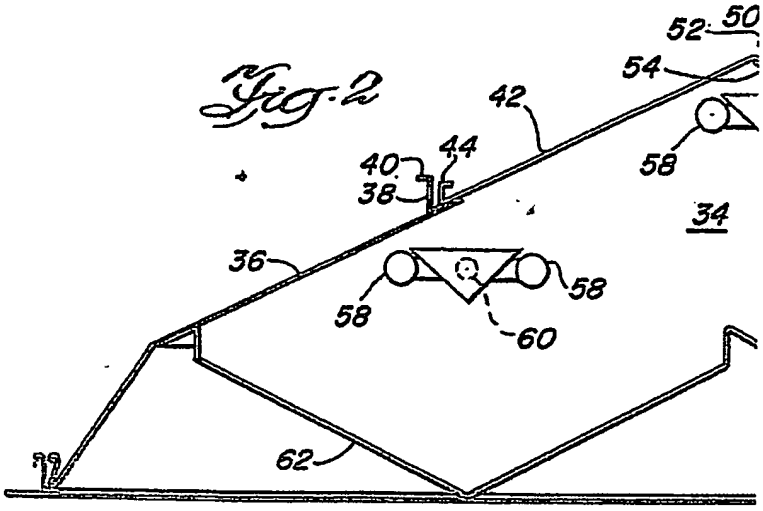


Fig. 2



1,136,728 COMPLETE SPECIFICATION
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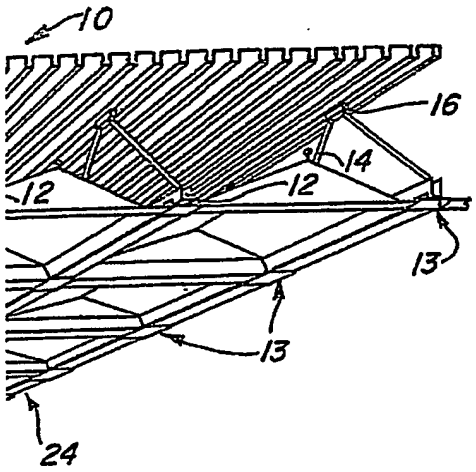


Fig. 1

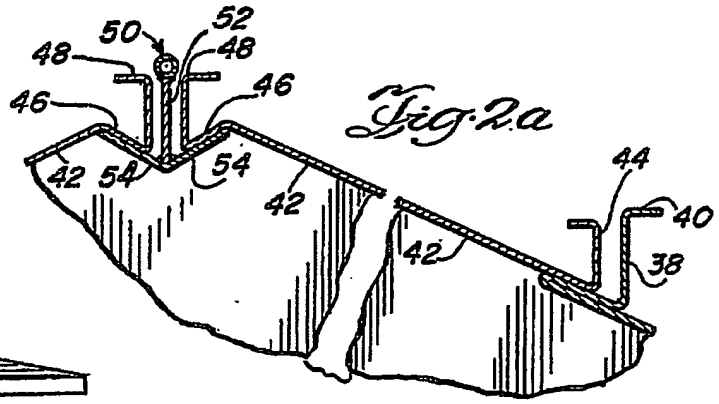
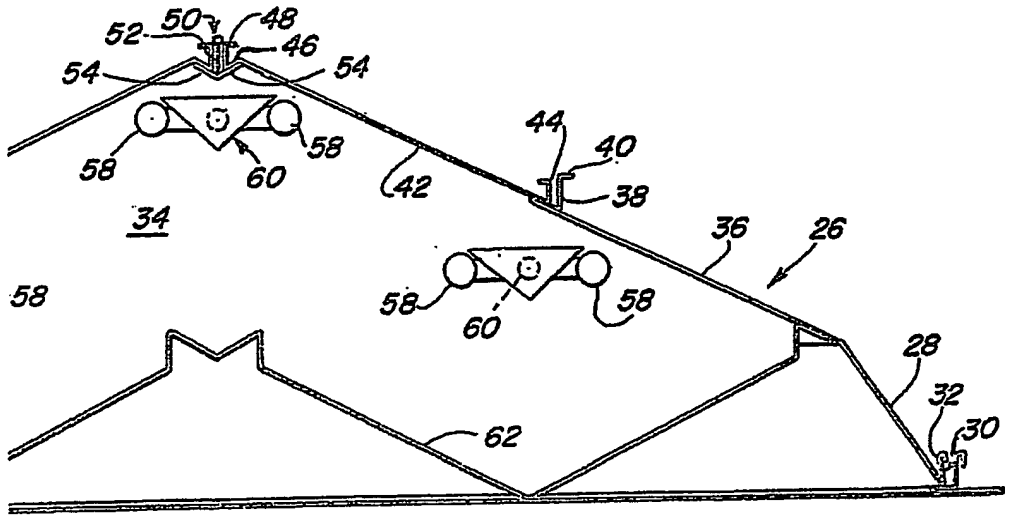


Fig. 2a



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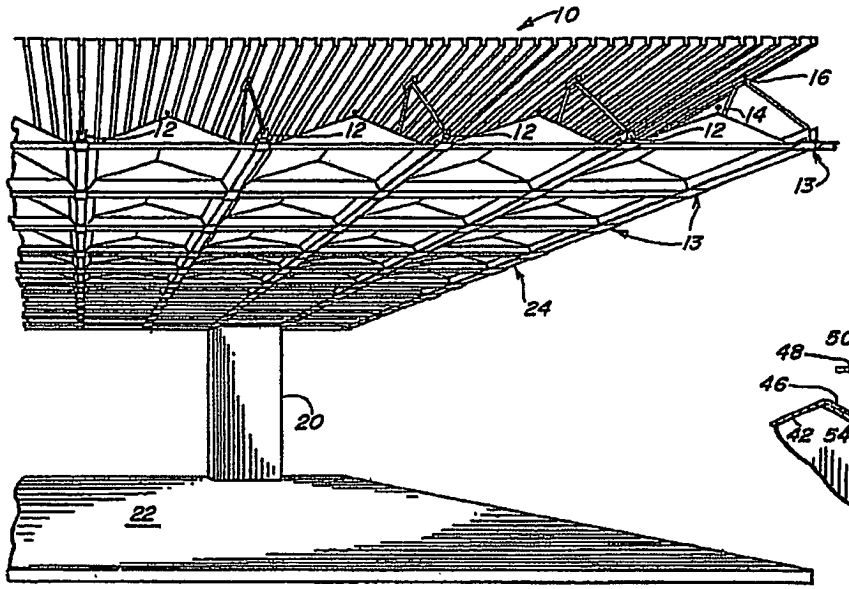

Fig. 1

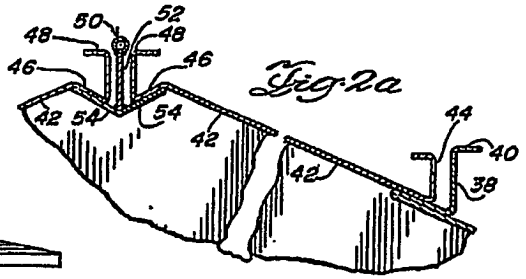

Fig. 2a

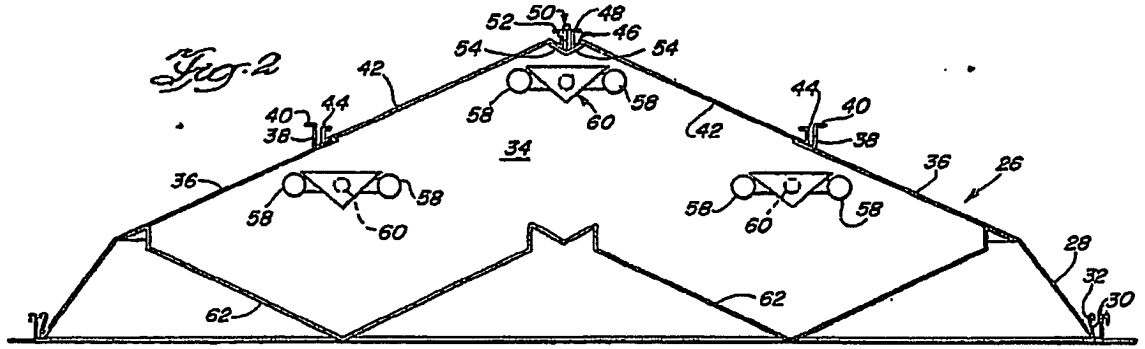

Fig. 2

Fig. 3

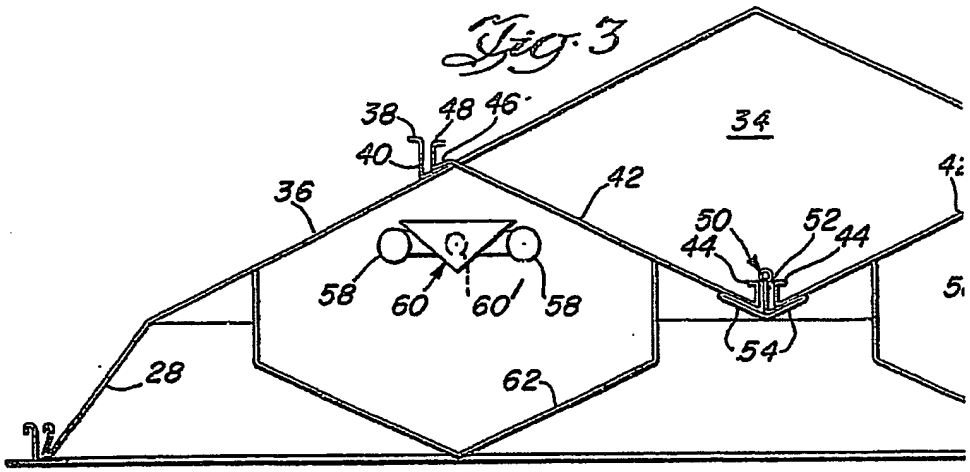
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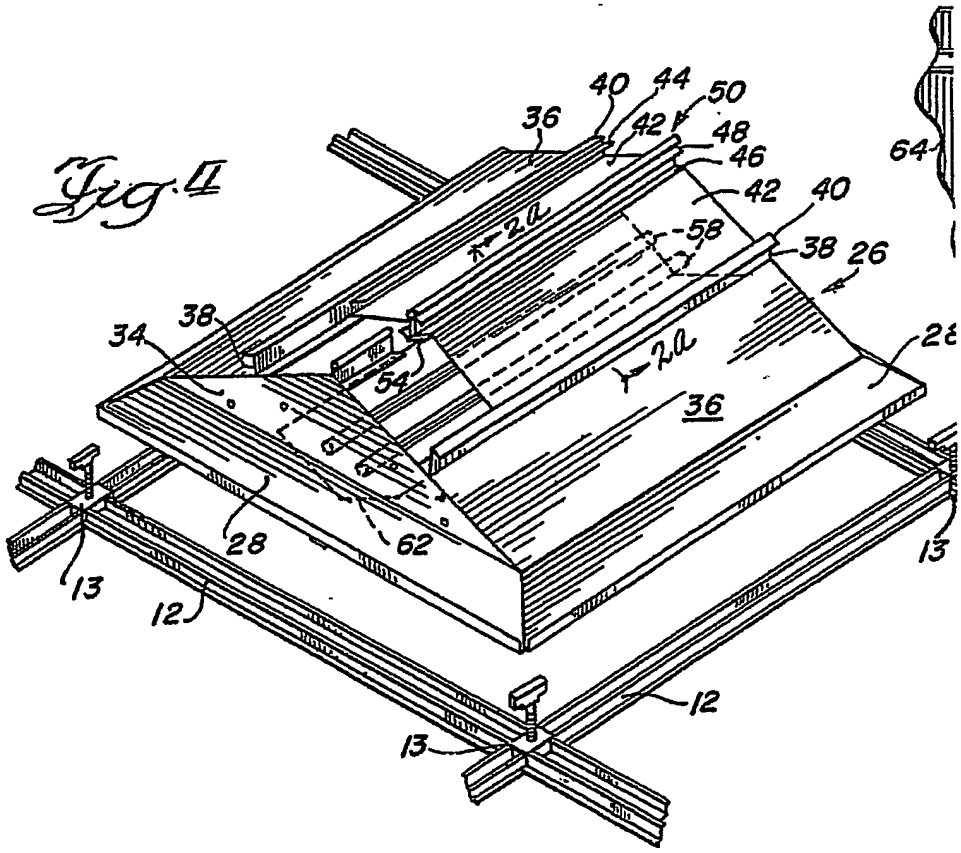
Fig. 4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1,136,728 COMPLETE SPECIFICATION
4 SHEETS

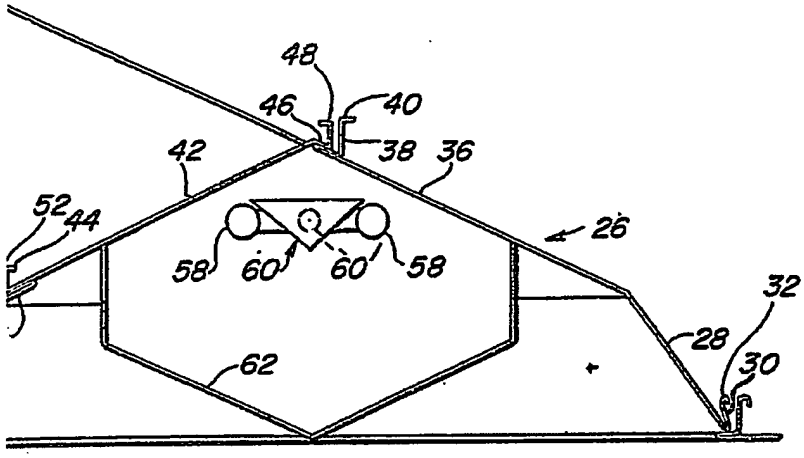
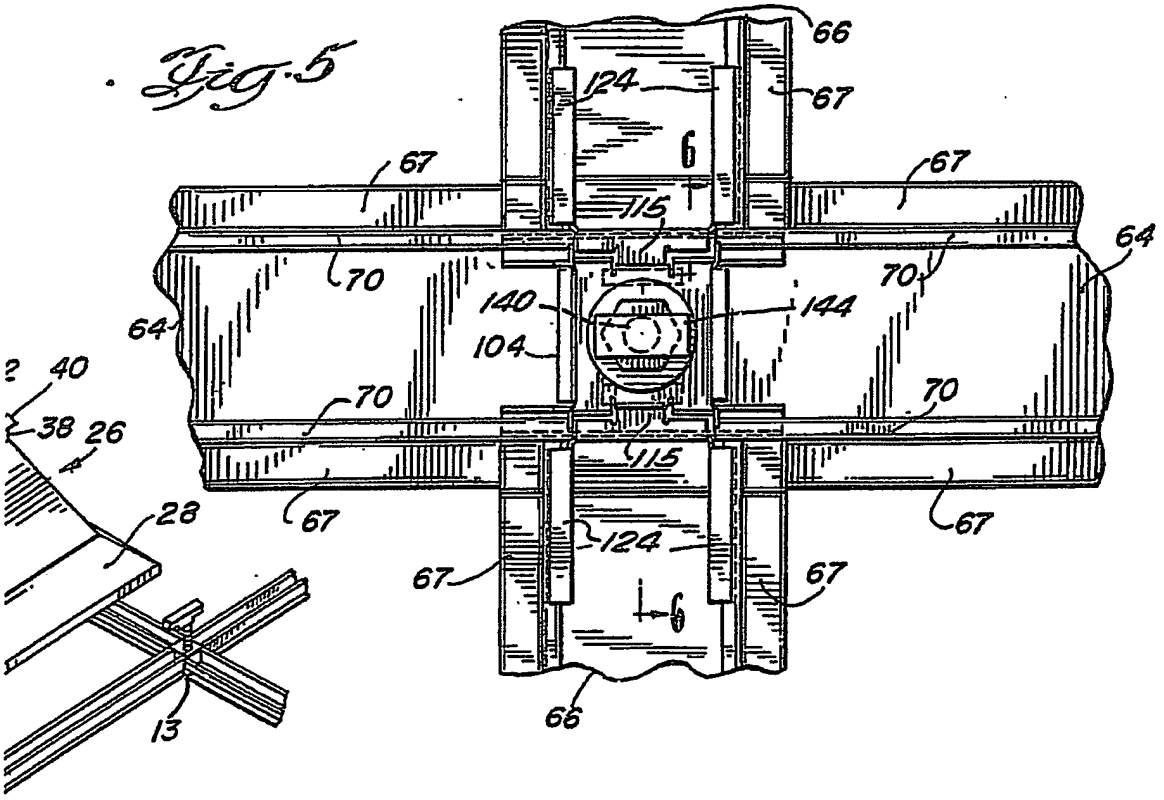


Fig. 5



1,136,728
4 SHEETS

COMPLETE SPECIFICATION

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SHEET 2

Fig. 3

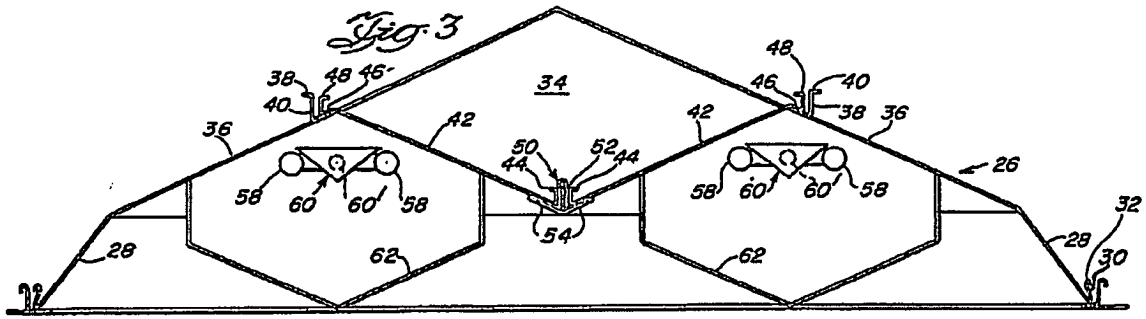


Fig. 4

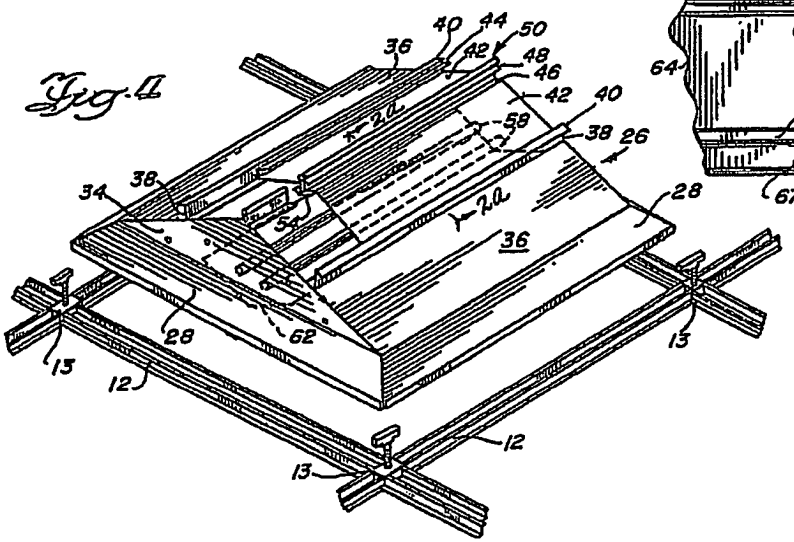


Fig. 5

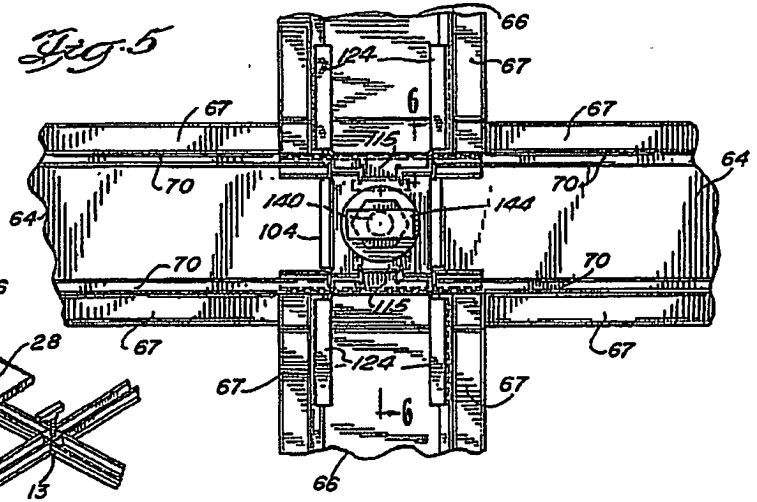


Fig. 6

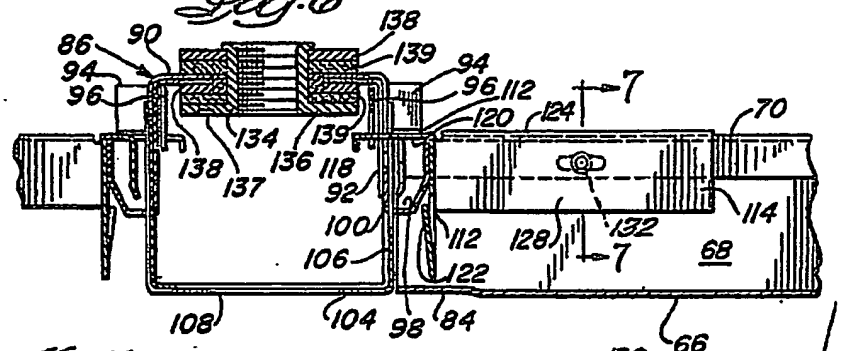
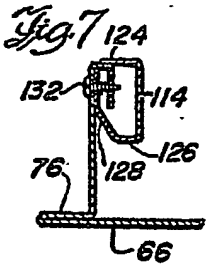


Fig. 7



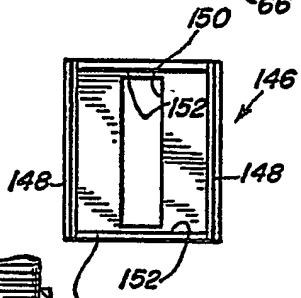


Fig. 8

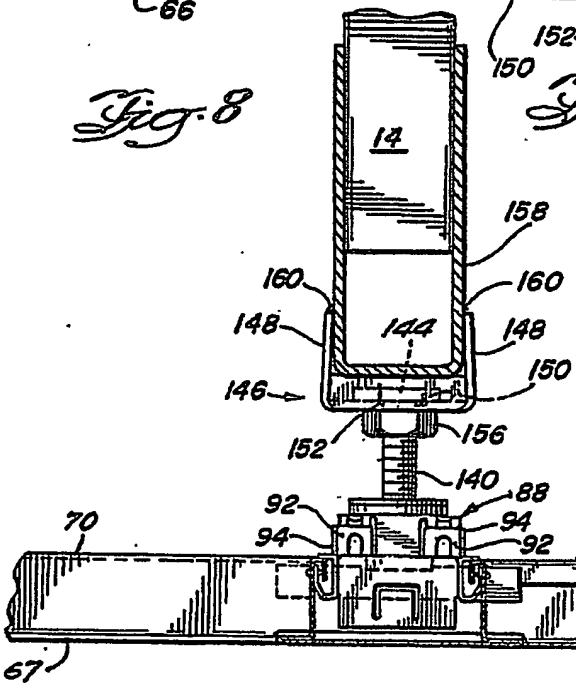


Fig. 8a

1,136,728 COMPLETE SPECIFICATION
4 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEET 3

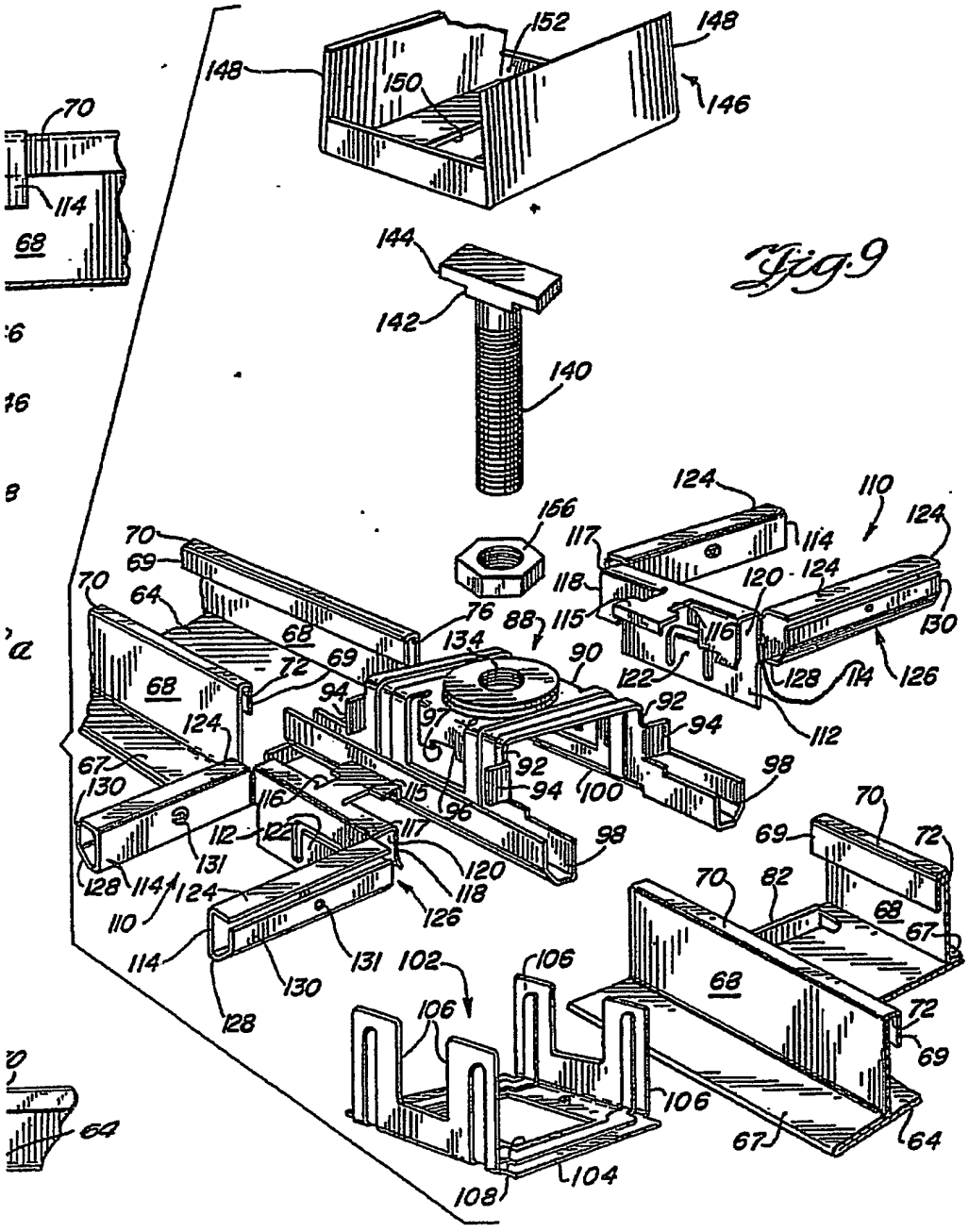


Fig. 9

1,136,728 COMPLETE SPECIFICATION
4 SHEETS
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SHEET 3

Fig. 6

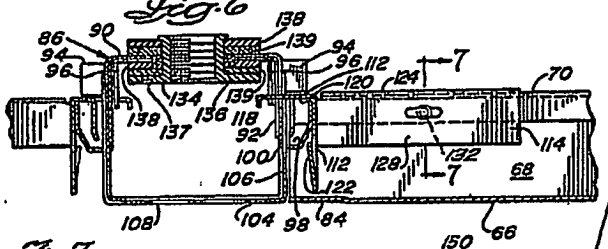
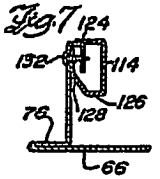


Fig. 7



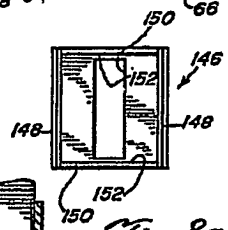


Fig. 8

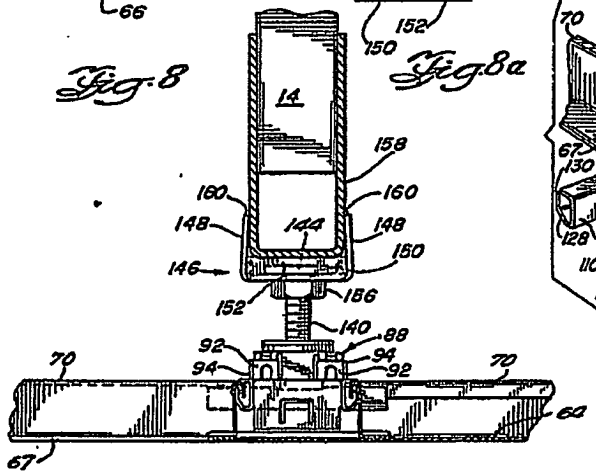


Fig. 8a

Fig. 9

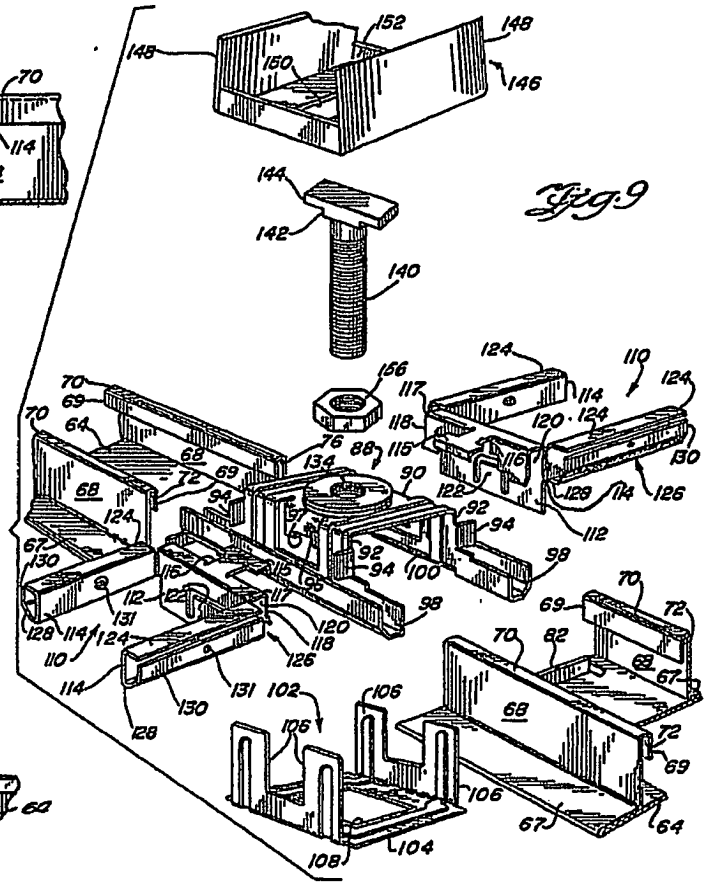


Fig. 10

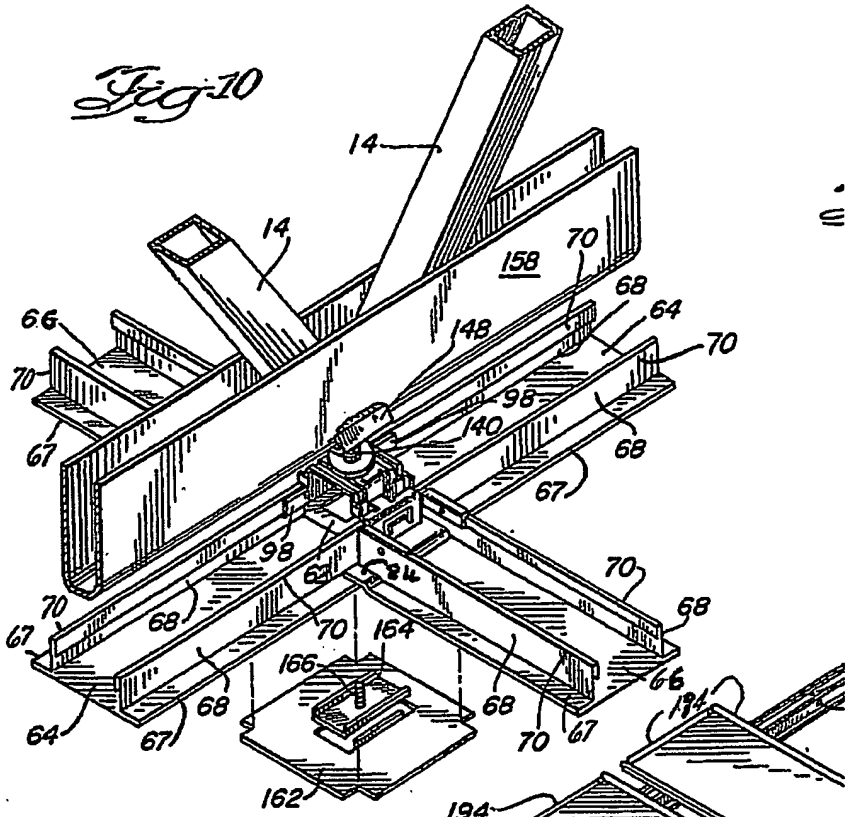

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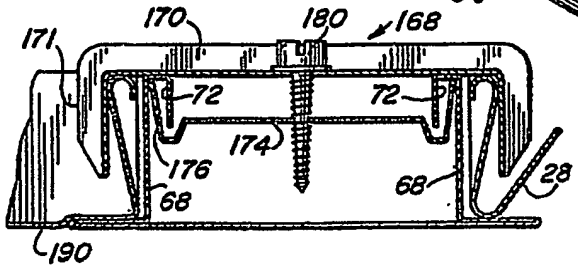
Fig. 11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1,136,728 COMPLETE SPECIFICATION
4 SHEETS

Fig. 12

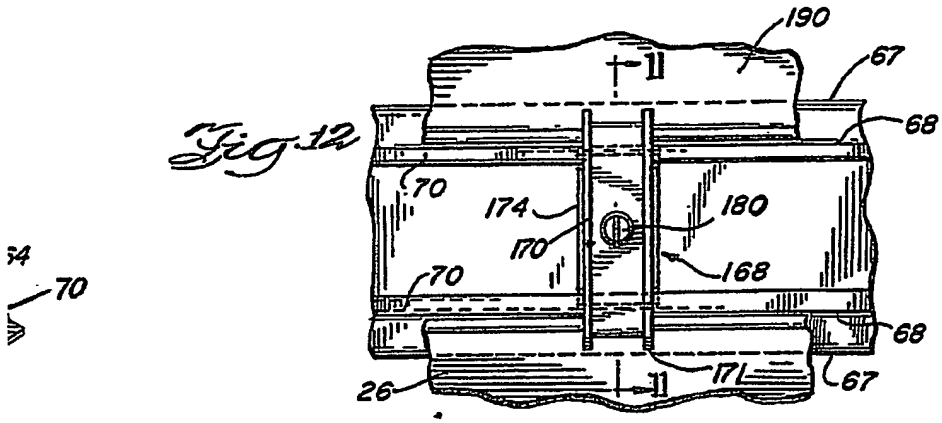
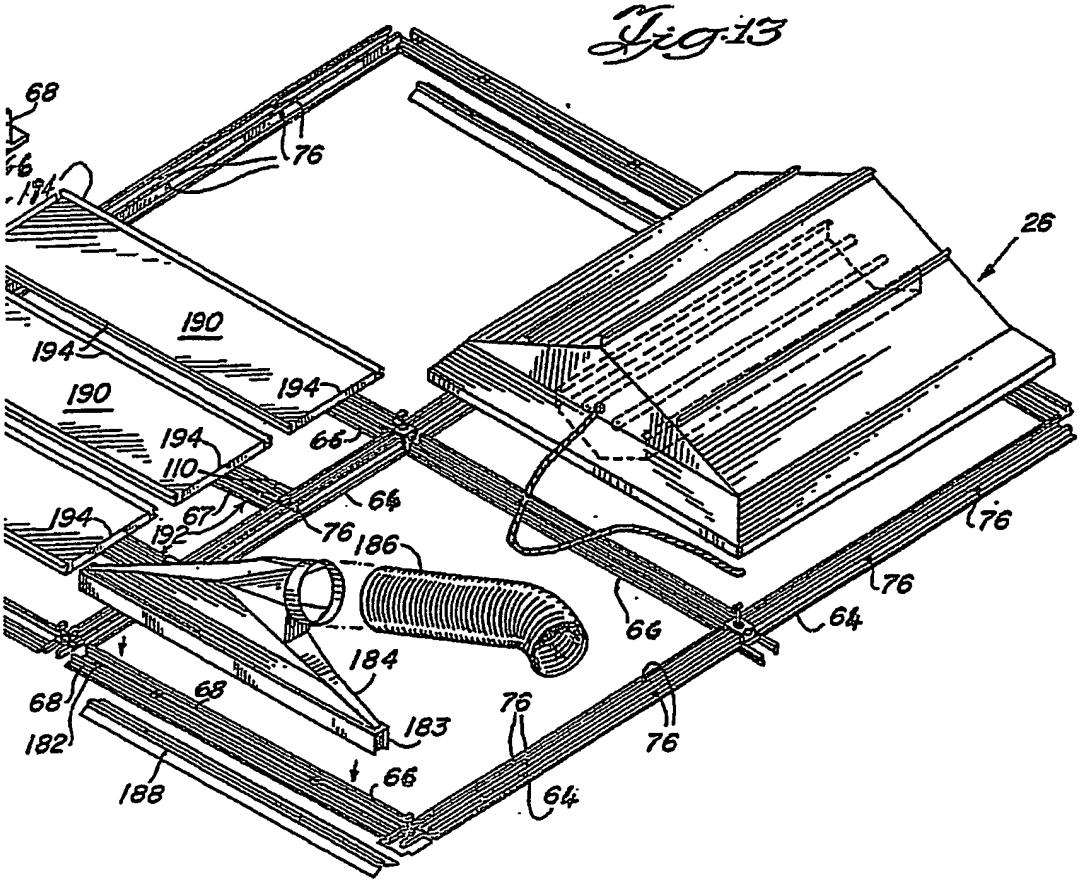


Fig. 13



1,136,728 COMPLETE SPECIFICATION
4 SHEETS
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SHEET 4

Fig.10

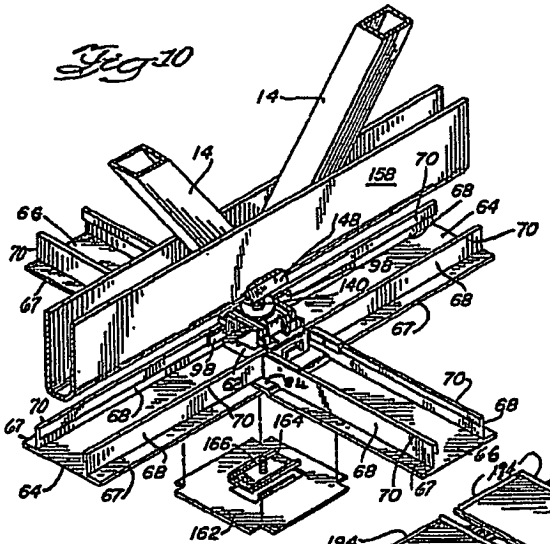


Fig.12

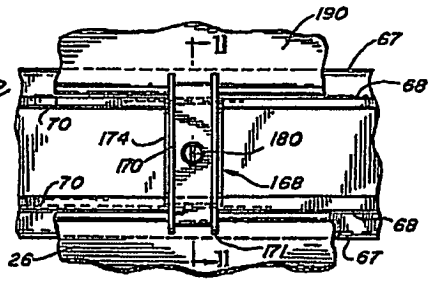


Fig.13

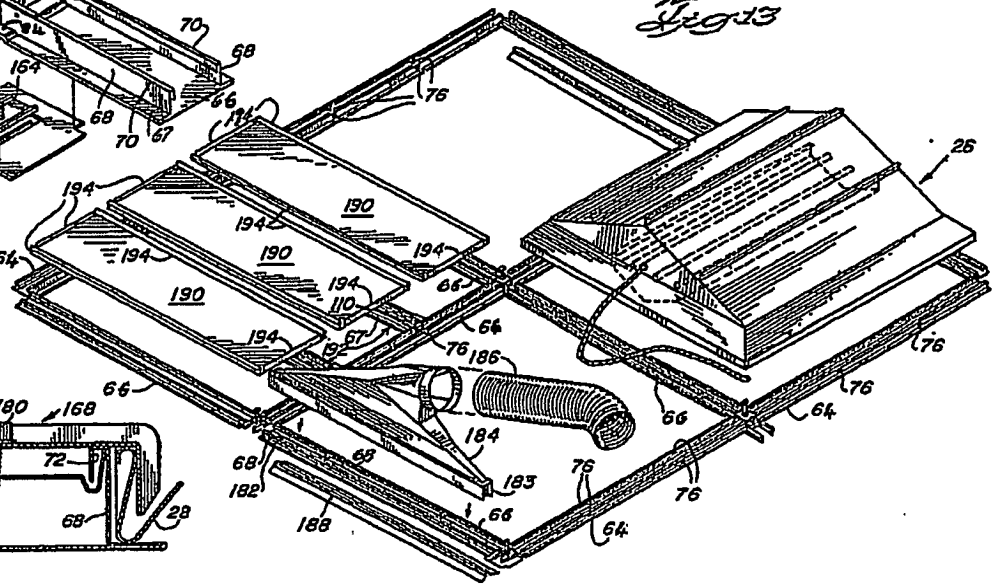
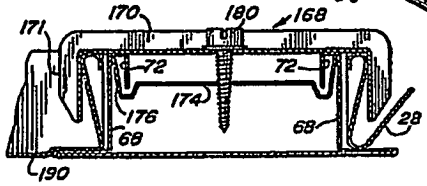


Fig.11



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